

Investigation on the interface between $\text{Li}_{10}\text{GeP}_2\text{S}_{12}$ electrolyte and carbon conductive agents in all-solid-state lithium battery

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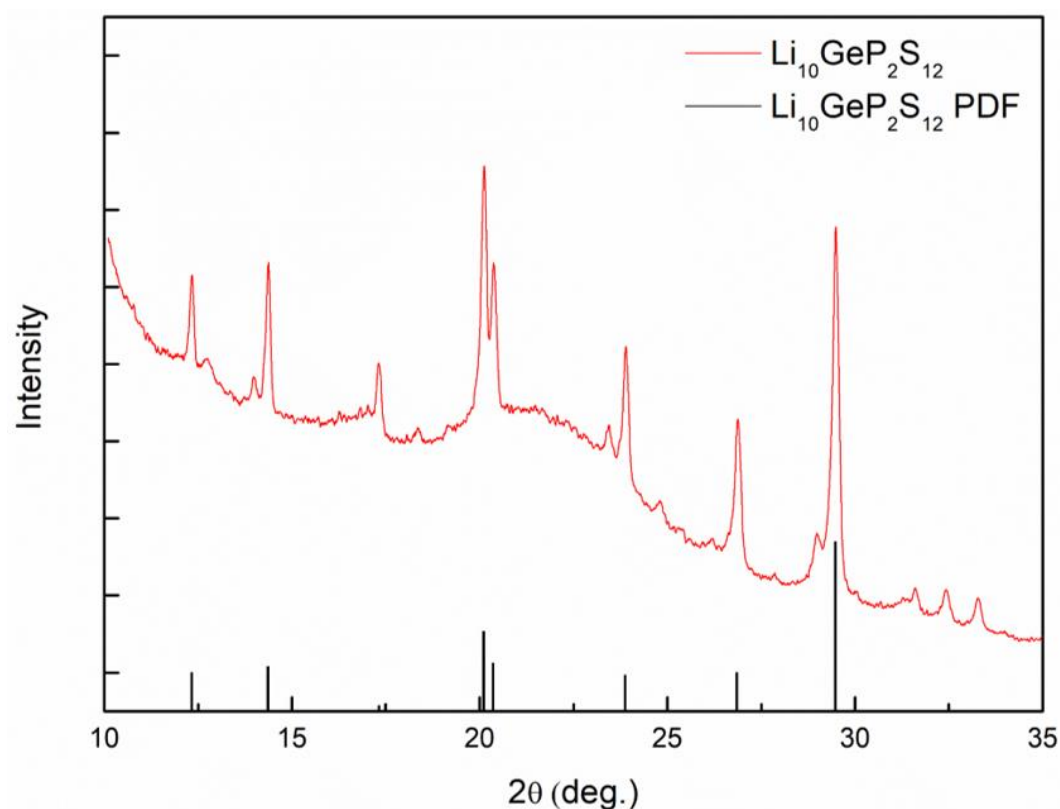


Figure S1. X-Ray Diffraction (XRD) pattern of LGPS solid electrolyte. XRD peaks of LGPS indicates that LGPS is successfully synthesized without side products.

$\text{Li}_{10}\text{GeP}_2\text{S}_{12}$	
Temp ($^{\circ}\text{C}$)	Conductivity (mS cm^{-1})
0	1.90
25	6.99
80	16.72

Table S1. Calculated ionic conductivity of LGPS. Table S1 shows that the ionic conductivity of LGPS in room temperature is close to the reported value in previous research.^{8,28}

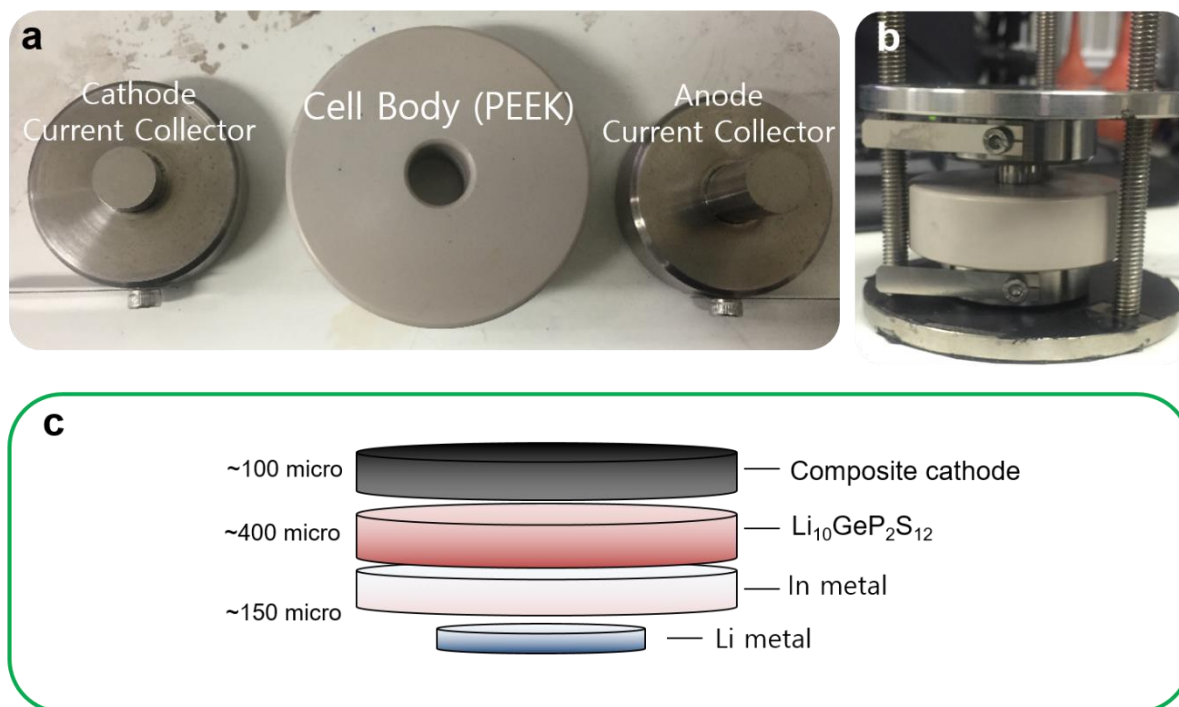


Figure S2. Images and schematic of ASSB employed in this work. **a**, Image of disassembled ASSB cell. **b**, Image of assembled ASSB cell with cell casing. **c**, Schematic of ASSB pellet inside the cell body (PEEK).

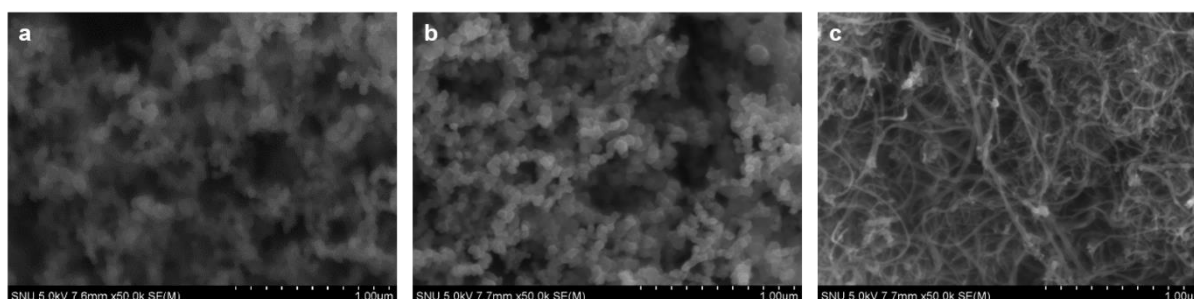


Figure S3. Scanning Electron Microscope (SEM) images for different types of carbon additives. **a**, SEM image of Super P. **b**, SEM image of Denka Black. **c**, SEM image of Multi-Walled Carbon Nanotubes (MWCNT).

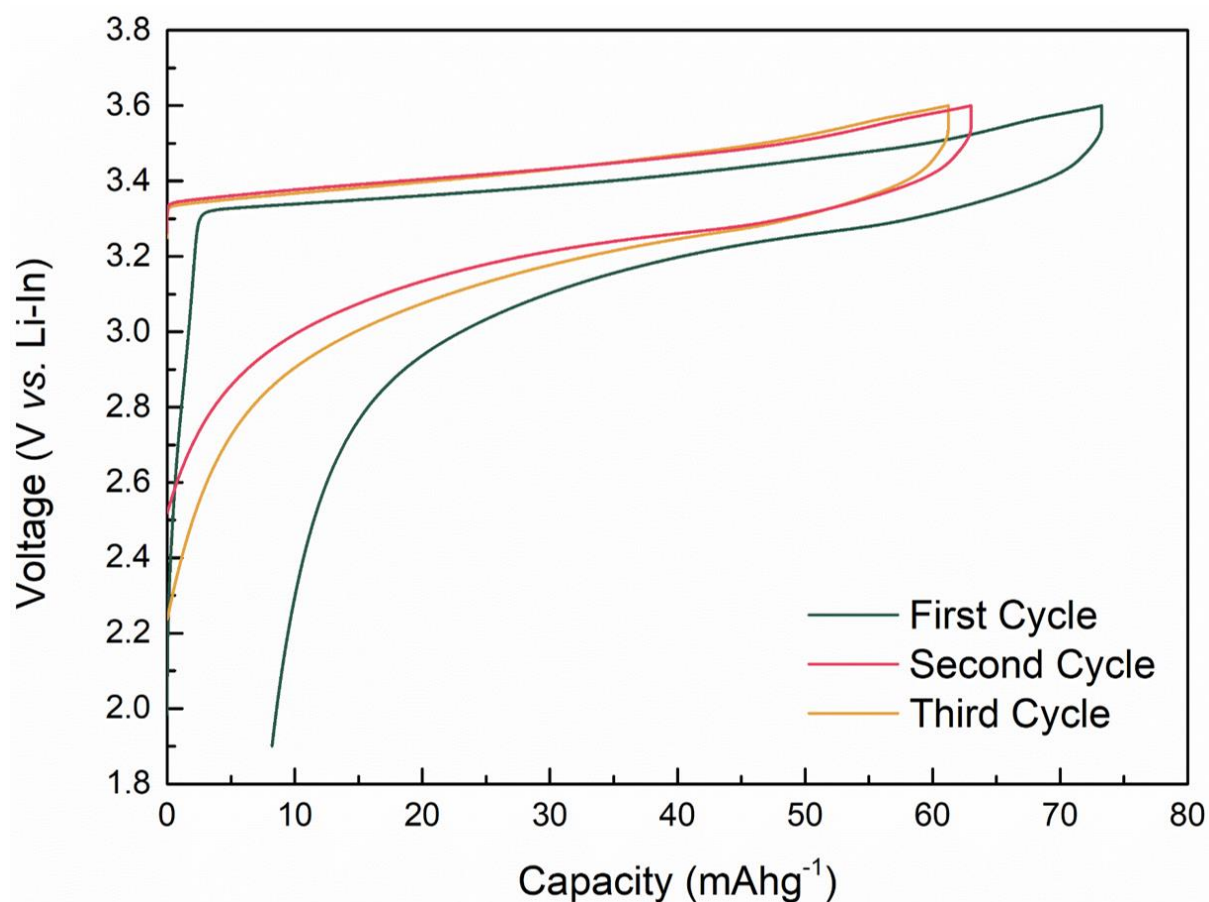


Figure S4. Electrochemical profile of 5 wt% Super P-containing ASSB. Electrochemical profile of 5 wt% Super P-containing ASSB for initial three cycles is shown. The additional slope in charging step is only observed in first charging process.

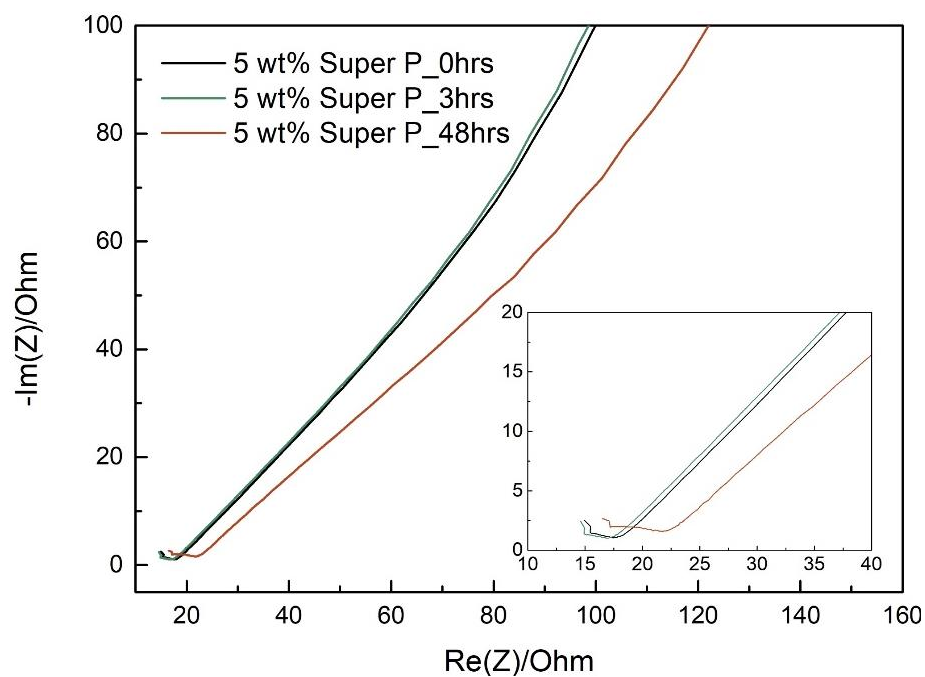


Figure S5. Electrochemical impedance spectra of 5 wt% Super P containing ASSB after various rest time. The inset graph is the magnification of initial electrochemical impedance spectra of ASSB with 5 wt% Super P.

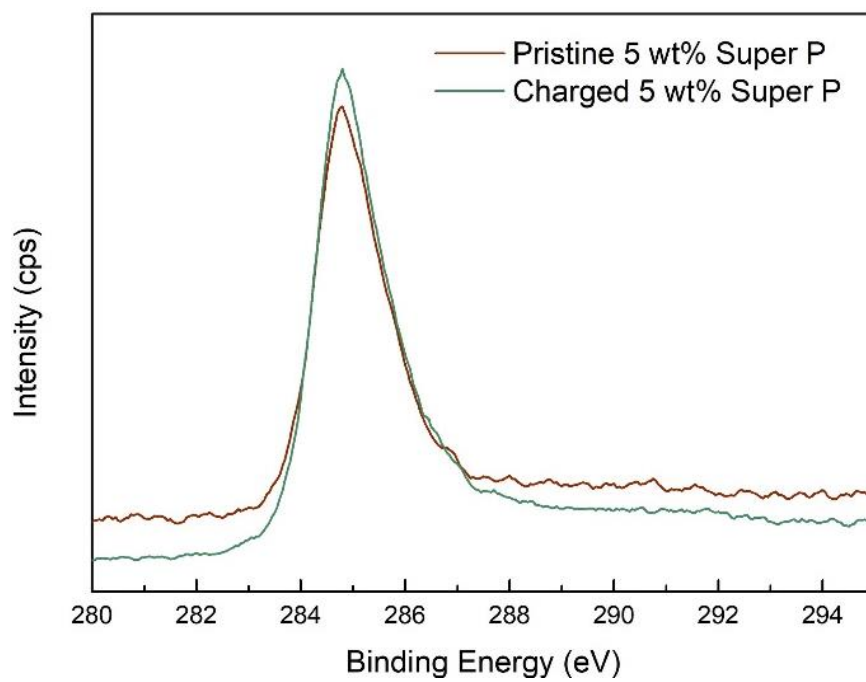


Figure S6. Carbon XPS spectra of composite cathode with 5 wt% Super P before and after charging process.